(19) Europäisches Patentamt
European Patent Office
Offic urop´en des brev ts

(11) Publication number : **0 510 875 A2**

(12) EUROPEAN PATENT APPLICATION

(21) Application number : **92303441.7**

(51) Int. Cl.[5] : **F16D 69/02**

(22) Date of filing : **16.04.92**

A request for correction of description, claims and abstract has been filed pursuant to Rule 88 EPC. A decision on the request will be taken during the proceedings before the Examining Division (Guidelines for Examination in the EPO, A-V, 2.2).

(30) Priority : **26.04.91 JP 122809/91**

(43) Date of publication of application :
28.10.92 Bulletin 92/44

(84) Designated Contracting States :
BE DK

(71) Applicant : **NICHIAS CORPORATION**
1-26, Shibadaimon 1-chome Minato-ku
Tokyo 105 (JP)

(72) Inventor : **Takahata, Sirou**
6-7-25, Tatsutaminami,Ikaruga-cho
Ikoma-gun, Nara-ken (JP)
Inventor : **Amakawa, Jirou**
6-2028, Hata
Kashiba-shi, Nara-ken (JP)
Inventor : **Tsuji, Masami**
2-27-24, Honmachi, Oujicho
Kita-Katsuragi-gun, Nara-ken (JP)

(74) Representative : **Allard, Susan Joyce et al**
BOULT, WADE & TENNANT, 27 Furnival Street
London EC4A 1PQ (GB)

(54) Frictional material.

(57) A frictional material is made of cloth which is impregnated with an impregnating agent such as a bituminous material, synthetic resin, etc. The cloth is woven by a multiple yarn made by twising single yarns optionally with reinforcing metal wires. The single yarn consists of a central core in the form of a robing or a yarn of inorganic fibers such as glass fibers, rock wool, ceramic fibers, etc. and a covering element in the form of a sliver of organic fibers such as staple fibers, aromatic polyamide fibers, flame-resistant fibers, etc. The frictional material obtained is excellent in physical strength and in resistance against heat, effective for preventing dispersion of dust and irritation to human bodies, and advantageous from the viewpoint of cost.

EP 0 510 875 A2

This invention relates to an improvement of a woven type frictional material to be used as a winch for a marine machine or a construction machine, a brake lining or an automobile disk pad.

One of the existing woven types of frictional materials (using cloth as its basic element) is made by preparing cloth which is woven with one of a mixture of asbestos fiber, aramid fiber, glass fiber, rock wool, ceramic fiber, staple fiber, or the like, and by impregnating the cloth with a bituminous material or a synthetic resin such as asphalt, gilsonite, tung oil, etc.

The existing frictional material indicated above, however, involves the following problems because of the fiber or fibers used as the basic element of the cloth:

(1) Among the fibers indicated above, asbestos fiber was considered to be an optimum frictional material because of its excellent resistance against heat and friction. However, the use thereof has been restricted because it adversely affects human bodies.

(2) Rock wool and ceramic fibers are physically weak and, during handling, produce dust which irritates the human skin.

(3) Glass fiber is physically strong, but produces dust during handling, as does rock wool and ceramic fibers.

(4) Staple fiber is not resistant against heat.

Since each of the fibers used as a basic element of existing frictional materials has advantages and disadvantages from different viewpoints, as indicated above, an improvement thereof is strongly desired.

We have now developed an improved frictional material which does not produce dust during handling and remarkably increases the physical strength of the frictional material without reducing the resistance to heat.

According to an aspect of the invention, there is provided a frictional material comprising cloth which is impregnated with an impregnating agent, the cloth being woven by using a single yarn which comprises a central core in the form of a robing or a yarn of an inorganic fiber and a covering element in the form of a sliver of an organic fiber.

Since the central core of the frictional material is a robing or a yarn of an inorganic fiber, it compensates the relatively less heat-resistant properties and physical strength of the sliver of organic fiber which covers the central core. The sliver of organic fiber prevents irritation to human skin by the robing or yarn of inorganic fibers. The impregnating agent increases the heat-resistance and physical strength and prevents dispersion of dust.

An embodiment of the invention is explained below with reference to Figs. 1 to 6, in which:

Fig. 1 is a side elevation of a multiple yarn of cloth for a frictional material embodying the invention.

Fig. 2 is a cross-sectional view of the multiple yarn.

Fig. 3 is a side elevation of a singl yarn which forms the multiple yarn.

Fig. 4 is a cross-sectional view of the single yarn.

Fig. 5 is a perspective view of a central core in the form of a robing or yarn.

Fig. 6 is a perspective view of a sliver covering element.

In these drawings, A designates a single yarn which forms cloth of a frictional material, 1 denotes a centre core in the form of a robing or a yarn of organic fibers, which forms the single yarn, and 2 indicates a covering element in the form of a sliver of organic fibers.

The term "robing" means an element made by converging numerous continuous fibers having microscopic diameters (unit of μ). The term "sliver" means a felt-like yarn obtained by covering a mass of disorderly oriented short fibers through a carding or a covering machine.

An optimum inorganic fiber to be used as the central core is a glass fiber which possess both heat resistance and physical strength. The glass fiber is preferably 100 to 300 TEX thick. Other fibers such as rock wool and ceramic fibers may also be used if they are continuous fibers. However, since they are short fibers which are difficult to shape into a robing, it is recommmended to mix them with staple fibers and slightly twist them into a yarn.

Representative organic fibers to be used as the covering element 2 are, for example, staple fibers, aromatic polyamide fibers (commercially available under the name of "Kevlar"), flame-resistant fibers (commercially available under the name of "Kainor" which is a carbon fiber made from a polyacrylonitrile fiber and having a low degree of carbonization).

The staple fiber is less heat-resistant. However, it is economic, and can be easily shaped into a sliver. In contrast, aromatic polyamide and flame-resistant fibers are short fibers, and provide less physical strength to a sliver made thereof. However, they are excellent in resistance against heat and in sliding property. They are more expensive than the staple fiber.

In view of the foregoing analysis, it is advantageous and most preferable to use a cotton-mixed sliver made by using staple fibers as a major element and adding one or both of aromatic polyamide fibers and flame-resistant fibers.

The mixing ratio of aromatic fibers and/or flame-resistant fibers with respect to staple fibers is preferably 20% or less. If it is more than 20%, the cost becomes high. The sliver is preferably 150 to 300 TEX thick.

Fig. 3 shows a procedure in which the single yarn A is made by winding the covering element 2 of organic fibers on the central core 1 in the form of the robing of inorganic fibers. The ratio of the central core 2 and

the covering element 2 in the singl yarn A is preferably such that the central core occupies 35 to 70% of the entirety. If it is less than 35%, the resistance against heat is reduced, and the cost increases. If it is more than 70%, the covering ratio decreases. The covering ratio of the central core by the covering element is preferably 100% in order to prevent dispersion of dust from the central core. However, it is difficult practically, and the order of 80% will be maximal.

Fig. 1 shows a procedure in which a multiple yarn is made by twisting the single yarn A with a metal wire 3. The metal wire 3 is used to increase the strength. By weaving the multiple yarn, cloth is obtained, which is excellent in physical strength and in resistance against heat and prevents irritation to human bodies. By impregnating the cloth with one or both of a bituminous material or a synthetic resin, a frictional material is obtained, which has an excellent physical strength and resistance against heat and prevents dispersion of dust. In particular, when the covering element 2 includes staple fibers as its major material, adhesion of the impregnating agent is improved, which leads to more perfect prevention of dispersion of dust.

As described above, the invention provides a frictional material which is excellent both in physical strength and in resistance against heat, effective for preventing dispersion of dust and irritation to human bodies, and remarkably advantageous from the viewpoint of cost.

Claims

1. A frictional material comprising cloth which is impregnated with an impregnating agent, the cloth being woven by using a single yarn which comprises a central core in the form of a robing or a yarn of an inorganic fiber and a covering element in the form of a sliver of an organic fiber.

2. A frictional material as claimed in claim 1 wherein the central core is a robing or a yarn made of one or more of glass fibers, rock wool or ceramic fibers.

3. A frictional material as claimed in claim 1 or claim 2 wherein the covering element is a sliver made of one or more of staple fibers, aromatic polyamide fibers or flame-resistant fibers.

4. A frictional material as claimed in any one of the preceding claims wherein the impregnating agent is a bituminous material and/or a synthetic resin.

5. A frictional mat rial as claimed in any one of the preceding claims wherein the ratio of the central core to the covering element is such that the central core comprises 35 to 70% of the yarn.

6. A frictional material as claimed in any one of the preceding claims wherein the single yarn is reinforced by twisting with a metal wire.

FIG. 1

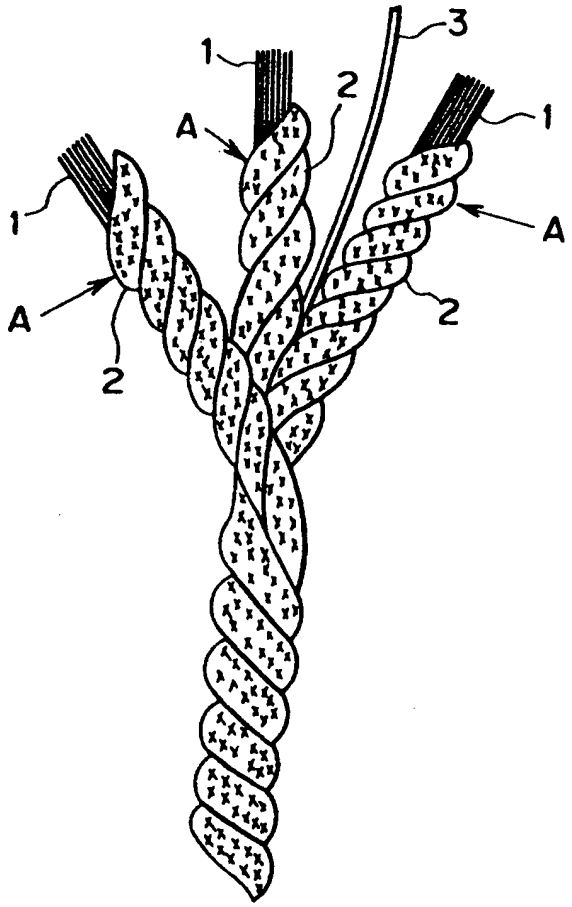

FIG. 2

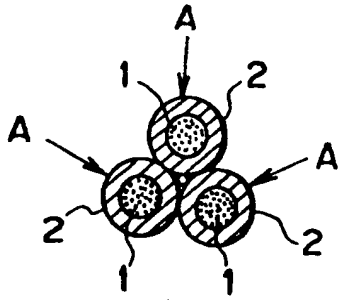

FIG. 3

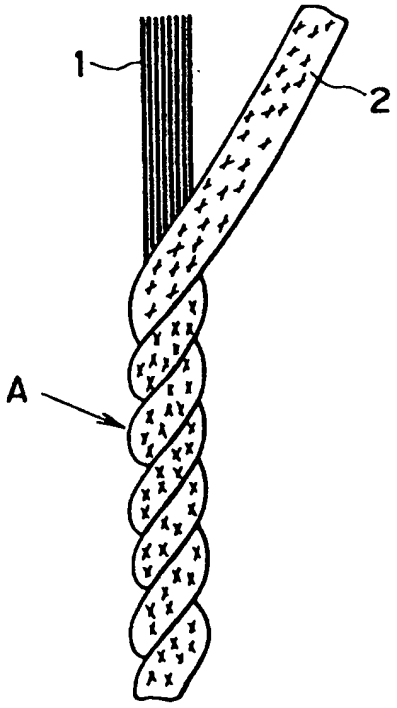

FIG. 4

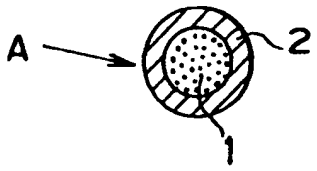

FIG. 5

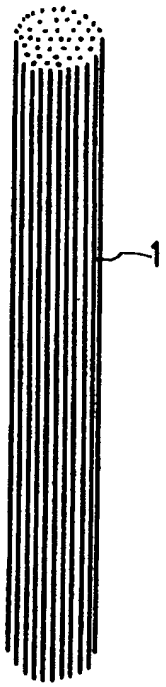

FIG. 6